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S. Tanaka, A. Saito, K. Kawamura

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GROWTH OF SCALLOP SPATS

By

Tanaka, Shunsuke

Saito, Atsushi

Kawamura, Kaname

Translated by Minori Miki

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(4 - 1) Growth of Scallop Spats by Natural Collection of Seeds.

MATERIALS AND METHOD

This experiment was conducted to examine the growth and survival rate of scallop spats in the early stage of development. At the same time the experiment was to provide information on spat release into the sea.

Spats in the early stage used for the experiment were collected July lst by natural seed collection. As shown in Table 3, the range of shell-lengths of spats were 1 - 2mm, 2 - 3mm and 3 - 4mm. These three groups each containing 50 indivisual spats were kept in a 'chalet' covered with nets. The 'chalet' were put into a pearl-net and suspended vertically off a raft into a water depth of 5 meters.

Measurements of increase in the shell-length and survival rates of spats in each group was conducted six times between the first day(July1) and the last day of the experiment(September 20).

Table 3 Growth and survival rates of scallop spats among different size groups.

第3表 ホタテガイ付着稚貝のサイズ別成長と生残率

年月日 date	size 1 ～ 2 mm サイズ			size 2 ～ 3 mm サ	
	①殻長mm ②(範囲)	③殻高mm ②(範囲)	④生残率 %	①殻長mm ②(範囲)	③殻高mm
49. 7. 1	1.8 ± 0.2 (2.0 − 1.4)	1.8 ± 0.2 (2.1 − 1.5)	100	2.5 ± 0.3 (3.0 − 2.0)	2.5 ± 0.
49. 7. 12	2.7 ± 0.3 (3.2 − 1.7)	2.6 ± 0.3 (3.2 − 1.8)	94	3.8 ± 0.4 (4.6 − 2.9)	3.8 ± 0.
49. 7. 24	4.2 ± 0.5 (5.2 − 3.2)	4.2 ± 0.5 (5.2 − 3.3)	86	5.5 ± 0.6 (6.6 − 4.2)	5.7 ± 0.
49. 8. 5	5.7 ± 0.7 (6.9 − 4.4)	5.8 ± 0.7 (7.0 − 4.5)	82	6.8 ± 0.8 (8.2 − 4.7)	7.1 ± 0.
49. 8. 16	7.1 ± 0.8 (8.8 − 6.2)	7.5 ± 0.8 (7.2 − 6.1)	80	8.6 ± 0.9 (10.2 − 6.8)	9.1 ± 1.
49. 9. 20	9.6 ± 1.0 (11.8 − 8.1)	10.3 ± 1.0 (12.4 − 8.4)	78	11.0 ± 1.3 (13.5 − 8.3)	11.8 ± 1.

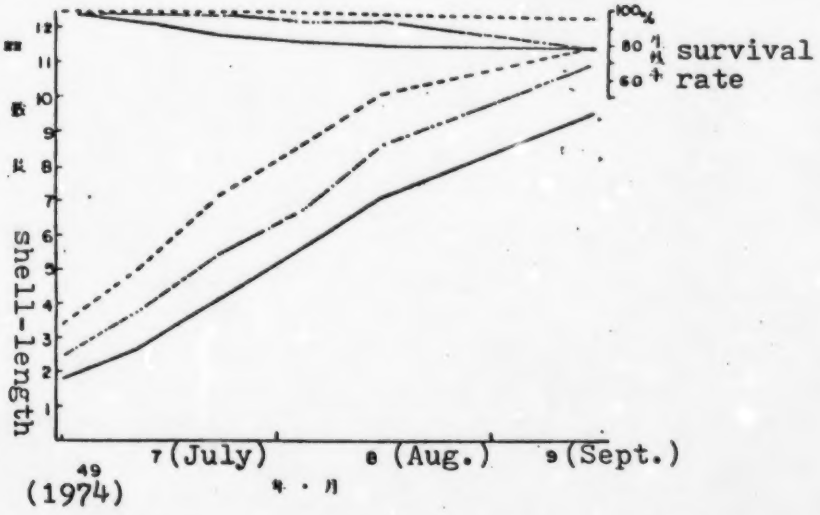
イズ		size 3 ～ 4 mm サイズ			⑤平均日間増殻長 μ／日	⑥平均日間増殻高 μ／日
②(範囲)	④生残率 %	①殻長mm ②(範囲)	③殻高mm ②(範囲)	④生残率 %		
(2.9 − 1.9)	100	3.4 ± 0.2 (3.9 − 0.3)	3.3 ± 0.2 (3.8 − 3.0)	100	−	−
(4.5 − 2.8)	98	5.0 ± 0.3 (5.8 − 4.3)	5.1 ± 0.3 (5.9 − 4.4)	100	115	118
(6.6 − 4.3)	98	7.2 ± 0.4 (8.0 − 6.3)	7.4 ± 0.4 (8.4 − 6.4)	100	149	161
(8.6 − 4.7)	94	8.7 ± 0.5 (9.8 − 7.7)	9.0 ± 0.5 (10.1 − 8.0)	98	119	128
(11.8 − 7.2)	94	10.1 ± 0.7 (11.8 − 9.0)	10.7 ± 0.7 (12.2 − 9.5)	98	139	164
(14.3 − 9.0)	78	11.5 ± 0.9 (13.4 − 7.6)	12.2 ± 1.0 (14.1 − 10.5)	96	60	67

1. shell-length 2. range 3. shell-height
4. survival rate(%) 5. daily increase of shell-length
6. daily increase of shell-height
7. date: 49(year of 1974)

RESULTS AND CONSIDERATION

The results of the experiment is shown in Fig. 7. The increase in the shell-length of each group between July 1 and September 20 was 7.8mm, 8.5mm and 9.1mm. The average daily increase in the shell-length between July 1 and July 24 was 104μ (1-2mm), 130μ (2-3mm) and 165μ (3-4mm).

Fig. 7 Growth of spats in early stage.



第7図 ホタテガイ初期付着稚貝の成長

However, between August 16 and September 20 the daily increase of shell-length in each group was 71μ, 68μ and 40μ and shows a decrease in growth compared with results from the earlier stage of the experiment.

It appears that an over-crowding situation amongst spats caused a retardation in the growth development of shell-length. It is positively recognized(3) that the density of spats in the containers at the time of thinning obviously influences the growth of the spats.

However, in case of attached spats not removed from the collectors, it is difficult to determine whether the density of spats has any influence on the growth as indicated with released scallop spats.

As shown in this experiment, the development of the large-size spats is faster in comparison with smaller-size spats.

It indicates a survival rate of 78% amongst the 1 - 2mm group and 2 - 3mm group from the experimental lot (September 20), and 96% for the 3 - 4mm size groups. It is not clear whether the decrease in the number of spat counts at this time is related to a natural cause. Furthermore, in the natural surroundings, the evidence of predation by asteroidea can be seen around the time of

seed collection. However, damage by asteroidea was not observed in this experiment.

Scallop spats in the experiment were prepared by removing them when still attached to the seed collector at July 1. They were arranged into three different size groups.

Measurements of spats took place with an all-round-projector after they were removed from the seed collector. They were placed into a container and immediately suspended vertically into the sea.

There was not much difference observable in the water temperature between the time the seeds were collected and when the spats were released at sea as compared to the differences recorded in artificial seed collection; the larva rearing temperature is 15° - 16°C and the sea water temperature at release time is 5.0° - 13.3°C in Hiranai-cho (Moura) at the beginning of May, 1974.

As mentioned before, a comparison between results of this experiment and from the artificial seed collection can't be made. However, it is highly possible that similar results could be obtained from artificial seed collection by adjusting the larval rearing temperature proximal to the natural sea temperature even though the spats are 1 - 2mm in shell-length.

(4 - 2) Growth ofScallop Spats by Artificial Seed Collection.

MATERIALS AND METHOD

Experimental samples of spats from an artificial seed collection were released in the mariculture grounds off Okunai Bay(Aomori) in April 28, 1975. (Mentioned in Section 3 -- Rearing of floating scallop larva and its release)

First thinning of spats was conducted at the time when they were large enough to be accomodated in 3mm pearl-net after removal from the collector.

Second thinning of spats took place on 15th October; 25 spats per pearl-net(approximately 4.5mm x 4.5mm).

Third thinning was carried out on 2nd December; 15 spats per pearl-net(approximately 9mm x 9mm).

After December 2nd thinning was terminated. On June 3, 1976, the spats were placed into round baskets; 15 spats/ rack x 10 (mesh size 2.1mm x 2.1mm) Spat measurements was conducted at the time of each thinning process.

During the period of December 3rd and 13th, the results of growth measurements of samples taken on December 2nd, 1975 was compared with results of 1975-spats(intermediate rearing stage -- vertically suspended) raised by commercial growers from different cultural grounds(Tairadate-Funaoka, Aomori-Ushirogata, Aomori-Okunai, Yokohamamachi).

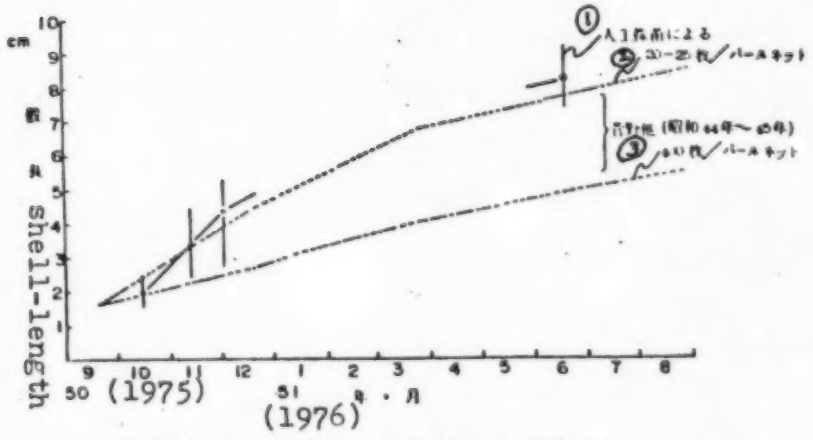
RESULTS AND CONSIDERATION

After spats were removed from the seed collectors, thinning of spats were carried out three times within a year. The fourth and final thinning was made on June 3, 1976 and the larvae were transferred into round-baskets(2.1mm x 2.1mm). Fig. 8 shows the growth of spats during this period. Also, growth comparison of loading between 20 - 25 spats per pearl-net and 400 spats per pearl-net, was made by Kanno and others[3], shown in Fig. 8.

As indicated in Fig. 8, our experiment with scallop spats from artificial seed collection derived better growth results than in experiment conducted by Kanno and others. Furthermore, according to 'Field Investigation

of Scallops -- May 24 - May 28, 1976' undertaken by Aomori prefecture, the average shell-length of 1975-spats cultured by 23 cooparatives in Mutsu Bay, is 5.3cm(8.5cm - 2.6cm). The average shell-length from our experiment gave a better growth by a factor of 2.5cm more(total weight 17 spats per kilogram).

Fig. 8 Growth of scallop spats by artificial collection of seed.



第8図 ホタテガイ稚貝(人工採苗による)の成長

1. growth of spats by artificial collection of seed.
2. experimental result by Kanno and others(20-25 spats per pearl-net). 1969 - 1970
3. experimental result by Kanno and others(400 spats per pearl-net). 1969 - 1970

Table 4 and Fig. 9 shows a growth comparison made in the beginning of December between spats from artificial seed collection and from specimens from the same-year in other commercial grounds.

Our experiment indicated 1.3 - 1.8 times more growth in shell-length and 2.2 - 5.0 times more in total weight. It is becoming more evident that spats from artificial seed collection shows as good a growth as observed in natural collection.

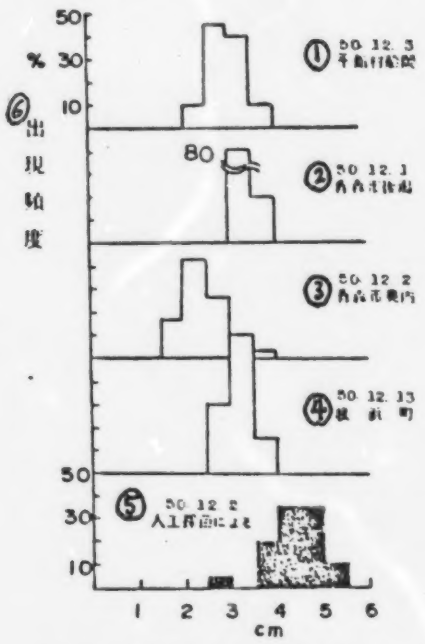
Table 4 Growth comparison of spats.

第4表 ホタテガイ稚貝（人工採苗による）の成長

①年月日	②殻長cm（③範囲）	④殻高cm（③範囲）	⑤殻巾cm（③範囲）	⑥全重量g（③範囲）	備考
⑫ 50.10.15	2.0±0.3(2.5−1.6)				⑦人工採苗による
50.11.13	3.4±0.5(4.5−2.4)	3.4±0.5(4.4−2.4)	0.8±0.1(1.0−0.5)	5.0	
50.12. 2	4.4±0.6(5.3−2.7)	4.3±0.5(5.1−2.8)	1.0±0.2(1.3−0.6)	9.9±3.2(16− 3)	
⑬ 51. 6.19	8.2±0.5(9.2−7.4)	8.0±0.5(8.9−7.2)	2.0±0.1(2.2−1.7)	58.9±9.9(83−42)	
50.12. 3	3.0±0.4(3.7−2.4)	3.0±0.4(3.7−2.3)	0.7±0.1(0.8−0.5)	3.3	⑧平館村船岡
50.12. 5	3.4±0.2(3.8−3.2)	3.5±0.2(3.8−3.3)	0.7±0.1(1.0−0.6)	3.7	⑨青森市後潟
50.12. 2	2.5±0.5(3.9−1.9)	2.6±0.5(3.8−2.1)	0.5±0.1(0.8−0.4)	2.0	⑩青森市奥内
50.12.13	3.2±0.3(3.9−2.7)	3.3±0.3(3.8−2.8)	0.7±0.1(0.8−0.5)	4.5±0.1(7 − 3)	⑪横浜町

1. date 2. shell-length 3. range 4. shell-length
5. shell-width 6. total weight 7. by artificial seed collection.
8. Tairadate(Funaoka) 9. Aomori(Ushirogata)
10. Aomori(Okunai) 11. Yokohamamachi 12. 1975
13. 1976

Fig. 9 Shell-length composition.



1. December 3, 1975 Tairadate(Funaoka)
2. December 1, 1975 Aomori(Ushirogata)
3. December 2, 1975 Aomori(Okunai)
4. December 13, 1975 Yokohamamachi
5. December 2, 1975 by artificial seed collection,
6. frequency

第9図 ホタテガイ稚貝の殻長組成

On April 28, spats by artificial seed collection were released into the sea. The shell-length of the spat already reached 1.0 - 2.5mm, while those from natural collection was about to commence. Obviously, artificial seed collection occurred earlier than in natural seed collection. Spats by natural seed collection were removed each year from the collector

during a period in late July and late August.

In recent years the seed collector have been gathering considerably larger number of spats. In natural surroundings there are no growth difference between spats which attached to the collector earlier or later in the season. It seems that these spats are smaller in size but we see more uniformity in the size of spats.

The removed spats are screened through a sieve regardless of the time they had attached to the seed collector. The spats remaining in the sieve are called 'i-chi-ba-n shi', meaning No. 1 spat.

The experimental seeds were product of one male and one female scallop. These group of spats share the attributes of the parents and demonstrate better growth.

However, when spats from natural seed collection are removed during late July and August, spats with shell-length over 1cm only are removed. As long as the shell-length are larger than 1cm, it does not matter when the attachment of the spat had taken place.

When the frequency of the spat deposit by natural collection of seed onto a 3mm - 4.5mm pearl-net reaches a certain percentage, the spats are screened through a

sieve(3mm - 4.5mm). The remaining spats in the sieve are dispersed into a pearl-net(3mm - 4.5mm).

It seems that the above mentioned method should work quite well. However, there are some problems in using such a method. Preventing the mixing of predators such as asteroidea and stone-borer at the time of screening and growth impediment by unclean nets must be avoided when small mesh nets are used.

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A research study funded by the Land Development Project Fund.

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Production of Scallop Seeds. No. 2 p.18-20

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